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Dates are grown commercially in the United States in the warm interior valleys of southern California and Arizona. Of the approximately 3,500 acres planted to dates in California <sup>1</sup> 3,000 are in the Coachella Valley, 200 are in the Imperial Valley, and 100 are in the Colorado River Valley near Bard. Of the approximately 700 acres of dates in Arizona,<sup>2</sup> about 500 acres are in the Salt River Valley near Phoenix, about 100 acres in the Colorado River Valley near Yuma, and the remainder scattered mostly in the Gila Valley and upper Colorado River Valley.

There are a good many seedling date palms in Texas, principally in the lower Rio Grande Valley and in certain localities between Laredo and San Antonio. With the exception of a few specimens at Laredo and one or two other points, the only imported varieties of date palms in Texas are in two small experimental plantings recently begun by the State agricultural experiment station, one at Weslaco, in the lower Rio Grande Valley, and the other at Winter Haven, in the so-called Winter Garden section.

## Climatic Requirements

For proper maturing of fruit, the date requires prolonged summer heat and low relative humidity during the ripening period. The very high temperatures of the districts found suitable for commercial date growing can be appreciated by comparing (table 1) the average daily maximum air temperatures of four date-producing districts with those for Washington, D. C.

TABLE 1.—Average daily maximum air temperatures in four date-producing districts as compared with those at Washington, D. C.

Month	Washington, D. C.	Carrizo Springs, <sup>1</sup> Tex.	Phoenix, <sup>2</sup> Ariz.	Yuma, <sup>3</sup> Ariz.	Indio, <sup>4</sup> Calif.
	° F.	° F.	° F.	° F.	° F.
January.....	41.0	66.5	65.0	66.8	69.6
February.....	44.0	73.5	69.1	71.9	74.8
March.....	51.0	78.7	74.1	78.1	79.6
April.....	63.0	85.9	81.8	85.4	86.2
May.....	74.0	91.3	90.0	92.7	92.7
June.....	83.0	96.1	100.9	101.5	102.1
July.....	87.0	99.1	102.7	105.4	106.5
August.....	84.0	99.2	100.9	104.1	105.5
September.....	78.0	93.4	96.7	99.6	100.6
October.....	66.0	85.0	85.9	88.0	90.7
November.....	54.0	74.0	74.5	76.2	80.4
December.....	44.0	65.5	65.0	67.3	70.7
Annual mean maximum temperature.....	64.0	84.0	83.9	86.3	88.3

<sup>1</sup> 8-year average.

<sup>2</sup> 35-year average.

<sup>3</sup> 53-year average.

<sup>4</sup> 30-year average.

<sup>1</sup> From California Cooperative Crop Reporting Service.

<sup>2</sup> Estimate based on report of Arizona Commission of Agriculture in 1934.

At Indio, in the Coachella Valley, the maximum temperature frequently exceeds 110° F. and has been as high as 122°. It is not known whether such very high temperatures are desirable. Date leaves are injured by prolonged air temperatures below 20°, but such low temperatures are of rare occurrence in the districts where dates are produced commercially in the United States.

Since the fruit of some varieties, such as Deglet Noor, cracks during periods of high humidity or light showers in late summer, they can be grown successfully only in regions in which there is practically a complete absence of such adverse conditions in the late summer period.

For varieties that are soft when picked, rain just previous to or during the picking period is likely to result in conditions favorable for development of mold or decay of the fruits.

### Varieties

Most of the dates grown commercially in California and Arizona are varieties originally imported as offshoots from selected date palms imported from the date-growing regions of the Old World, principally Algeria, Egypt, and Iraq. Dates may also be grown from seeds, but no two seedling palms are alike and relatively few of them are likely to produce fruit of good quality. However, when a seedling palm appears outstanding in any way it can be propagated by its offshoots, which will always reproduce the parent palm. It becomes then essentially a new variety or clone. Some new varieties originating in the date-producing districts of California and Arizona have been named, are being propagated, and may have promise for the future; however, it takes many years to prove their commercial value and to propagate sufficient offshoots for large plantings. Of the date acreage here reported, it is estimated that seedlings account for about 20 percent in Arizona and 10 percent in California. However, much of this acreage represents closely spaced, more or less neglected plantings, from which the fruit is not of appreciable commercial importance.

Of the imported varieties, those of the greatest commercial importance are listed below.

**Deglet Noor** (dĕg'let nōor).<sup>3</sup>—A semidry, medium to rather late ripening date; the principal variety grown in the Coachella Valley of California, in which locality it accounts for about 80 percent of the total acreage. In most parts of Arizona it has failed to succeed largely because of the susceptibility of the fruit to damage from rain and high humidity, but in some instances failure was partly due to the fact that this variety is apparently not adapted to the heavier soils on which it has been planted. Yields of 200 to 300 pounds per palm have been harvested under favorable conditions. A 7-year-old Deglet Noor palm is shown in the foreground in the cover illustration. Six bunches of fruit can be seen out of a total of 10 which the palm is bearing.

**Khadrawy** (ku drāw wī).—A soft, early ripening date; the second most important variety in the Coachella Valley and now grown in all date-producing districts; in Arizona, more extensively planted than any other variety; has proved fairly well adapted to a rather

<sup>3</sup> The phonetic spellings given after variety names are not to be considered exact transliterations of the Arabic but merely attempts to give pronunciations that would be recognizable in the country of origin and at the same time conform as nearly as possible to established usage in the United States.

wide range of conditions; palm smaller than any other commercial variety; yields light, seldom more than 100 to 150 pounds per palm.

**Saidy** (sī ā' dī).—A somewhat soft, midseason date; grown in a few large plantings in both the Coachella and Imperial Valleys. There are a few older palms of this variety in Salt River Valley, Ariz., where considerable losses of fruit during humid weather have not encouraged further planting. Palms appear to be rather slow coming into bearing, but eventually yield almost as much as the Deglet Noor.

**Zahidi** (zā' ī dī).—A semidry, midseason date that has been planted to some extent in all date-producing districts. Growers of this variety claim its fruit can be handled more economically than that of most of the other varieties, although it is generally regarded as somewhat lacking in quality. Yields are comparable to Deglet Noor.

**Halawy** (há lā' wī).—A soft, early ripening date grown in all date-producing districts, within which over a period of years it has been relatively little damaged by occasional rains and humidity. Its principal disadvantage is a tendency to shrivel during ripening, although this objection is not usually serious on the heavier soils with adequate irrigation. Yields 150 to 200 pounds per palm.

**Kustawy** (kūs tā' wī).—A soft, midseason date grown in all date-producing districts, but no longer planted in the Coachella Valley, because of its small size and a rather pronounced tendency for the skin to separate from the flesh. Better fruit has been produced in heavier soils in other localities. Its record for withstanding occasional damp weather is equal to that of Halawy. Yields 150 to 200 pounds per palm.

The following varieties, while grown in the date-producing districts mentioned, have not been extensively planted and represent a total acreage less than that for the previous six varieties: Dayri, Salt River Valley and lower Colorado River Valley; Hayany, Salt River Valley; Iteema, Salt River Valley; Khalasa, Salt River Valley; Maktoom, Coachella Valley and Salt River Valley; Sayer, Salt River Valley; Tazizoot, Coachella Valley; Barhee, Coachella Valley; Thoory, Coachella Valley and Imperial Valley. Of these varieties, the fruit of Iteema is particularly susceptible to damage from damp weather, and considerable losses often occur with that of Hayany and Tazizoot. Thoory is the only dry or so-called bread date that has been propagated in the United States, and there are only about 250 palms in commercial gardens at the present time.

### Pollination

Date palms are dioecious—that is, the male flowers, which produce the pollen, and the female flowers, which produce the fruit, are borne on separate palms. For commercial fruit production the female flowers must be pollinated by hand. The more usual method of pollination is to cut the strands of male flowers from a freshly opened male inflorescence, and invert two or three strands between the strands of the female flower cluster during the first 3 or 4 days after it has opened. Twine is usually tied around the pollinated cluster near the outer end to hold the male flowers in place and to prevent the strands of the female cluster from becoming entangled as the cluster works its way down through the leaves. To provide for the expansion of the cluster as the fruit develops, the twine is commonly tied in a



slipknot, allowing sufficient length of the free end to permit later adjustment to the maximum size of the bunch.

When the male flowers have been held before using until the flowers shatter, it has been found more economical to use dried pollen. This dried pollen is generally applied by dusting it on cotton and placing one or two pieces about the size of walnuts between the strands of the female cluster.

Careful pollination will usually cause from 50 to 80 percent of the blossoms to set fruit, which is sufficient for a full crop.

### **Propagation**

A date variety is propagated by offshoots, which develop during the early life of the palm from axillary buds on the trunk. When, after 3 to 5 years of attachment to the parent palm, these offshoots have produced roots and have started to produce axillary buds, they are ready to be cut from the parent palm. By this time the offshoot will have a base diameter of 8 to 12 inches, and will weigh from 60 to 80 pounds.

The offshoot is separated from the trunk of the parent palm by driving a large chisel into the connection with a heavy hammer. The leaves of the offshoot are pruned back to about 3 feet above the fiber and tied up. Great care should be taken to avoid unnecessary injury to any roots just starting. After planting, the top should be wrapped in burlap to avoid excessive drying by the wind, and the wrapping should be retained, at least during the first winter, to provide protection from low temperatures.

Offshoots are usually separated from the parent palm and planted any time from April to July.

### **Soil Management**

The cultivation, cover crop, fertilization, and irrigation practices now in use in the date gardens of this country are largely the result of commercial experience. Fertilization has generally been found necessary to maintain quantity and quality of production. Animal manures are widely used in the better date gardens of the Old World and are applied in California and Arizona in addition to cover crops. Fertilizers that improve cover-crop growth probably indirectly improve the growth of the date palm. Growers may determine the immediate effect of fertilizers upon palm growth by fertilizing a few palms and then comparing their appearance and fruit production with similar unfertilized palms.

Preliminary irrigation experiments in the Coachella Valley indicate that at least 8 to 9 acre-feet of irrigation water per year are necessary for good production on bearing palms. The frequency of irrigation will depend upon individual conditions. In general, during the warmer weather dates are irrigated every 10 to 14 days; during the winter, every 30 to 40 days.

### **Pruning**

When leaves are 3 to 4 years old they begin to die gradually, starting at the tips. The value of the older or partially dead leaves in producing plant food for sizing and maturing the fruit is not known. At

present it is commercial practice to retain older leaves until the dying of the tips occurs, and then remove such partially dead leaves at any convenient time, usually during winter or early spring.

### Thinning of Bunches or Strands

The usual method of thinning is to cut back the tips of all the strands of the female flower cluster at the time of pollination. The operation is then easily performed with a single cut, since the strands of a freshly opened inflorescence are compact and relatively tender. At the same time some growers also cut out entirely a certain proportion of the strands from the center of the cluster. However, most growers postpone the thinning out of the strands for several weeks until the bunch has begun to work its way down through the leaves. At this time some entire bunches are cut out if the number is in excess of what the grower considers desirable for the size and vigor of the palm. In cutting back the tips and in thinning out the strands, the removal of a total of about 50 to 60 percent of the flowers or fruits on the bunch has been found desirable.

### Control of Insects and Diseases

The principal insects attacking the fruit are the date mite, the Indian-meal moth, and the dried-fruit beetle, sometimes called the two-spotted fig beetle. The date mite, which attacks the fruit while it is in the green stage and causes serious scarring of the fruit surface, is controlled in commercial gardens with sulphur dust (or nicotine sulphate spray). The other two insects are killed by fumigating the fruit after it is picked, but before it is stored or packed. Carbon disulphide has been more generally used than any other fumigant, but because of its objectionable odor and high explosiveness it has been replaced in many packing houses by prepared gases distributed in pressure cylinders.

Two scales which attack the palm were introduced with the original importations of offshoots from the Old World. *Parlatoria*, the more serious of the two, is now believed to have been eradicated by a strenuous campaign recently completed by Federal and State agencies. The other scale insect, known as the red date scale, also sometimes referred to as the Marlatt scale, occurs on all palms of imported varieties in the commercial date districts of California and Arizona. Due no doubt to the fact that the attack of this insect is confined almost entirely to the thick leaf bases and the other protected portions of the palm, it apparently seldom causes appreciable damage.

### Diseases

Considerable study of date diseases as they occur in California and Arizona has been made by the State agricultural experiment stations of the two States. The Citrus Experiment Station at Riverside, Calif., has given particular attention to problems of this kind. For detailed information on the subject reference should be made to publications covering these investigations, especially the bulletin on diseases by H. S. Fawcett and L. J. Klotz, and the recent papers by D. E. Bliss in the reports of the Annual Date Growers' Institutes. Only the more important diseases are discussed briefly here.



*Decline disease.*—The name of this disease is descriptive of the more obvious visible effects, which are retarded growth, loss of vigor, and eventual failure to fruit. The most important symptom for identification is root rot, as the effects on growth and fruiting are believed to be secondary. Decline is a fungus disease which attacks the roots and usually continues to spread slowly through the soil from one palm to another. Palms of the Deglet Noor variety are highly susceptible to the decline disease, and they become worthless after a few years. Other common varieties appear resistant, although many of them may be affected to some degree. This disease, which was first noted in 1921, is now found in more than 20 date gardens in the Coachella Valley. Thus far, total fruit production has not been materially reduced, but in some individual gardens the losses have been serious. No curative measures have been discovered, although the infestations may be eradicated by means of soil disinfection with carbon bisulphide. Since the disease is spread from place to place on offshoots from affected palms, growers should obtain offshoots only from healthy palms well removed from areas of infection.

*Diplodia.*—Diplodia disease is caused by a fungus that sometimes affects leafstalks and offshoots. It causes leaves to show dull reddish- or yellowish-brown streaks in the midrib, and may cause offshoots to die. It is seldom serious in the well-cared-for gardens. Fawcett and Klotz recommend spraying infected palms and offshoots with ammoniacal copper carbonate, after first removing infected leaves and dead tissue and taking the further precaution of disinfecting pruning tools by dipping them in a solution of formalin after each palm is treated.

*Black scorch.*—Palms affected by black scorch have groups of leaves which are stunted, distorted, and blackened as though scorched by heat. Inflorescences and fruit stalks appearing among the diseased leaves will also be affected by the fungus. In the United States the Thoory variety seems to be most susceptible. Usually it develops only on occasional palms, which generally outgrow the trouble.

*Graphiola.*—Infection by graphiola may be suspected if the leaves develop a smutty appearance with age. This disease is more prevalent in the humid districts. It attacks the leaves, forming numerous small dark-brown or black cylindrical elevations from which yellow spore dust escapes. Severe infections may affect adversely the growth and fruiting of the palm by causing early death of leaf tissue. However, graphiola is not of economic importance in the present date-producing districts of California and Arizona, being apparently held in check by low humidity. In south Texas infections are more severe, and bordeaux spray has been found beneficial.

*Diseases of fruit.*—During humid weather in the ripening season several fungi may develop on the fruit, causing spotting, shattering, and rotting of the dates. Investigations thus far have failed to show practical means of preventing such losses. Better ventilation of the bunches sometimes helps. To this end, wire spreaders, inserted in the center of the bunch, have been used by some growers. Where humid weather occurs more or less regularly during the fall, growers frequently avoid some loss by picking dates just before they are fully mature, completing the ripening in warm maturation rooms.

*Checking, blacknose, and tearing.*—These disorders of the fruit are not due to diseases but to both weather and physiological conditions.

Relatively high humidity in the latter part of the growing period, just before the fruit loses all of its green color, frequently produces small lineal checks in the skin, varying somewhat in character and severity with the variety. Such checks usually dry up, and, if not pronounced, may be only minor blemishes on the fruit. Sometimes, however, the checks are severe enough to lower the grade or produce cull fruit. In the Deglet Noor variety severe checking is commonly followed by a darkening and shriveling of the tip of the date, known as blacknose. While the occurrence of blacknose is undoubtedly associated with humidity, severe thinning and probably other unknown factors predispose the fruit to this physiological trouble.

If the fruit comes in contact with water just before it begins to soften, tearing and cracking of the skin result. Fruit so affected is sometimes a total loss and is always more susceptible to subsequent attacks of decay-producing fungi. After the fruit is fully ripe, it is not subject to tearing, but the absorption of water through the skin at this stage creates a condition that is favorable to fermentation and souring. Coverings of heavy paper placed over the bunches just before ripening are quite generally used to prevent or reduce this type of injury as a result of rain. However, such covering does not prevent damage from fungi or from checking and blacknose during prolonged periods of humid weather.





